

systems was best; but the teaching of English continued to make fairly rapid headway, and was popular with Indian gentlemen. A despatch from the Court of Directors of the East India Company, written by Sir Charles Wood in 1854, dealt with the whole question in a most masterly way, and practically set the question at rest in favour of the higher teaching being conducted on Western lines and through the medium of English. This despatch was quickly followed in 1856 by the creation of regular education departments in the great provinces of India, manned largely by graduates of English universities, and in 1857 by the establishment of the Calcutta University, and later on of the Universities of Madras and Bombay.

It says much for the faith and energy of those in power in India in 1857 that during the actual period of the Indian Mutiny steps were being taken to create Indian universities, and to foster in every way the educational advancement of the country.

The Calcutta University thus had a clear and favourable field for its operations, for the spread of education through the medium of English was at once warmly welcomed by Indian gentlemen, and year by year it continues to increase in favour. So rapid, indeed, has been the growth of high education in India that within the area originally allotted to the Calcutta University, two other universities (Punjab and Allahabad) have had to be created, and still the numbers from the restricted area are almost more than can be dealt with by that university.

At the time of the formation of the Calcutta University the London University was thought to be the best model to be followed, but judging by results it would probably have been better if the model of the older universities had been followed, if residential colleges had been formed, and if a teaching rather than an examining university had been started. In time probably the latter will be the ideal which will be aimed at in India.

The Calcutta University, for nearly the first fifty years of its existence, has confined itself mainly to the task of merely examining students sent up to it from recognised or affiliated institutions. Of course, by laying down subjects for examination the university has practically determined the subjects which had to be taught in the colleges and schools sending up the candidates, but the university has hitherto exercised no control as to the fitness of the affiliated institutions for the work they were supposed to carry on. At first little trouble arose from this fact, but great difficulties arose owing to the extraordinarily rapid growth in the number of colleges and schools, which rose at one time to about eighty colleges and about 600 schools, which had the privilege of sending up candidates. Many of such institutions were competing with each other with fierce rivalry, and some, if not many, attracted students largely by lowness of fees and laxity of discipline. Many institutions were thus working under unsatisfactory conditions, they were inadequately and imperfectly staffed, and they had few teaching appliances. They suffered indeed so acutely from extremely inadequate funds that really they could not do more than they were actually doing. With the sending up of very large numbers of imperfectly trained candidates for examination, and their consequent failure, the usual desire to lower standards was manifested, and the examinations almost necessarily became suited to the average level of the affiliated institutions and to the teaching there given.

It was with a view to raise the whole tone and standard of university education in India that a new University Act was passed some four years ago, and under this a complete set of new regulations has been framed. Under them standards are being raised,

courses are being made more thorough, examinations are being made more practical, specially in the science subjects, original research is being fostered, and has been made compulsory for the higher degrees in science and literature, and post-graduate study is being encouraged by the creation of university readerships and professorships.

In other important matters attempts are being made to deal with the residence and discipline of college students, and to bring influence to bear on the formation of their characters. In the past the condition of affairs in these respects has been somewhat deplorable, and the general influence of the surroundings of students has left much to be desired. What is really wanted for India is a series of residential colleges of the type of the Mohammedan college at Aligarh, in the United Provinces, where most excellent work is being done, intellectually, physically, and morally. Under these new regulations, in order to retain affiliation or recognition, all institutions sending up candidates to the Calcutta University have to be inspected periodically by the university authorities, and are bound to conform to certain standards of work, of equipment, and of care for the well-being of their students, while numerous other reforms have been insisted on.

The new regulations are being gradually but firmly introduced, under the Vice-Chancellor, Mr. Justice Asutosh Mukerji, who is one of the most distinguished of the graduates of the Calcutta University, but it will naturally take many years before their full effect will be felt. In the future too much stress cannot be laid on the desirability of closer and closer union between the colleges and the university, and the assumption of the higher teaching by or under the immediate direction of the university itself. The development of the residential system is also much to be desired if discipline is to be improved and character formed. The eloquent speeches delivered at the Convocation on March 14 by H.E. the Chancellor (Lord Minto), and the Vice-Chancellor (Mr. Justice Mukerji), show that these objects are being steadily kept in view, and that the work of reform is progressing steadily, and perhaps even rapidly. It will hence be agreed that there is a bright future in store for the Calcutta University.

#### RECENT WORK ON PLAGUE.<sup>1</sup>

SINCE Yersin's discovery of the *Bacillus pestis* in 1894, bacteriological experiment has shown the possibility of spreading plague infection among rats and other mammals through the intermediation of fleas. The reports before us are concerned especially with the proof that this is the means by which epidemics are actually set up. Such proof may be summed up as follows:—

In the first place Major Lamb, with the members of the commission, who carried out the work under the ægis of the advisory committee, shows by numerous charts and by series of maps that the epidemic follows closely in time and place the distribution of the epizootic among *Mus rattus*. In Bombay this epizootic, in its turn, is similarly related to that among *Mus decumanus*. In earlier reports they have dealt with the results obtained by using

<sup>1</sup> (1) *Journal of Hygiene*, vol. vii., No. 6, December, 1907. Third extra number, containing Reports on Plague Investigations in India, issued by the Advisory Committee appointed by the Secretary of State for India, the Royal Society, and the Lister Institute. (Cambridge: University Press.) Price 6s.

(2) "Report on Plague in Queensland (February 26, 1900–June 30, 1907)." By B. Burnett Ham. (Brisbane: Public Health Department, 1907.)

(3) "The Etiology and Epidemiology of Plague. A Summary of the Work of the Plague Commission." Pp. vi+93. (Calcutta, 1908.) Price 4 annas, or 5d.

Liston's ingenious method of experimentation with guinea-pigs. It has been shown that these animals are very rarely infected from soil or clothes grossly contaminated with cultures of the *Bacillus pestis*, or from other plague-infected guinea-pigs, so long as fleas are excluded. On the other hand, they readily contract plague when exposed to the attacks of fleas which have fed on plague-infected animals. Following up this method, the commission placed healthy guinea-pigs in buildings where it appeared that plague was contracted, and found that the test animals died of plague, and, further, that the fleas they picked up in these surroundings could be transferred to fresh animals in the laboratory and infect them also with plague. An exceedingly interesting experiment on these lines was carried out in Sion Village. One part of this village was evacuated by the inhabitants on the discovery of a dead rat. The commission at once took advantage of the "guinea-pig method," and substituted a population of healthy guinea-pigs for the decamped inhabitants. These guinea-pigs were confined to their several houses, and all chance of direct spread of infection among them was excluded. In these circumstances an epizootic appeared among the new population, which progressed through the village, following the distribution of a simultaneous epizootic among the rats (*M. rattus*). The guinea-pig plague was so severe that thirty-six out of fifty-one animals put in the houses died.

The evidence brought against the direct spread of plague from man to man rests on the immunity of hospital staffs, and of friends of patients in hospital, who very frequently lived at the bedside throughout the course of the disease. Again, the village of Worli offered an example of what often occurs. Three cases of plague were imported into the village, but in the absence of an epizootic the infection did not spread.

With regard to the beginning of an epizootic in a fresh locality, it seems that infection may be carried by a healthy man and spread from him to the rats of his dwelling. Such infection, the commission supposes, is flea-borne. The yearly recrudescence of plague may be due to such fresh importation, or to the persistence of acute plague throughout the year, affecting only a few rats. The commission found in two Punjab villages that cases of chronic plague abscess in rats occurred at intervals all the year round. Whether such cases might be able to rekindle an epizootic of acute plague is not clear, and seems to demand further experiment.

With regard to the spread of infection during an epidemic, the Queensland report gives us valuable data. Mr. Burnett Ham, dealing with small epidemics, and a population more amenable than that of Bombay to sanitary regulation, was able to trace definitely the source of infection in a large majority of cases to houses, stores, or ships where the presence of infected rats was proved. An exceptional occurrence was the outbreak of pneumonic plague in Maryborough in 1905. The infection in this instance spread directly from patient to patient; nine cases occurred.

The seasonal exacerbation of plague remains unaccounted for. In Queensland and in Bombay, in opposite hemispheres, the plague-seasons still broadly coincide, though the plague-maxima in Queensland varied considerably—from February to August—in different years. A study of the figures given for the variations in the flea-infestation of rats does not reveal a complete explanation of the phenomenon. For instance, the Punjab experiments show that fleas

become frequent months before the plague season begins. Fleas were actually on the decrease when rat-plague was rising to its maximum in Kasel and Dhand. Nor can we suppose that the temperature in Bombay in the cold season is low enough to keep plague in abeyance until the spring. We learn from the reports that the mean temperature of Bombay for the cold season is about 75° F., and a glance at the chart, which gives meteorological data in connection with the Queensland epidemics, shows that plague may appear, spread, and maintain itself under a mean temperature varying between 50° and 70° F. The Queensland report, in addition to epidemiological data, gives a large amount of clinical information, and experiments on the prophylactic and curative value of anti-pest sera. Experiments with rat-viruses carefully maintained at high virulence gave results more encouraging in the laboratory than in the field.

Major G. Lamb is responsible for the third volume under notice, and he has used the opportunity to give us a very clear outline of the present state of knowledge on the subject of plague. He also indicates the lines along which sanitary measures may be taken with advantage. While stating that this summary represents his personal opinions, he shows how these opinions arise logically out of the experiments carried out by the commission.

The lacunæ in our knowledge are brought into a healthy prominence by a summary of this nature. We do not yet possess trustworthy information as to rat population (part ii. B.), while our only means of taking a census is that of recording the percentage number of rats caught per traps set. One thing is pretty clear—that the most efficient trapping will never of itself reduce the rats of any considerable area below the minimum necessary for the spread of an epizootic.

Part iii. disposes of transmission of infection by direct contact, by the air, by food, or through the soil, and gives the proofs for transmission by the rat-flea. Direct contagion certainly occurs in pneumonic plague, but this is so rare as to fall outside the main problem.

Though man plays a minor rôle in the spread of an epidemic (part iv.), yet he is directly concerned in the importation of the disease into healthy areas (part vii.). It has been shown that hungry rat-fleas will cling to man and yet refrain from feeding for a considerable time. The man in the meantime may have travelled some distance and have arrived at a house where rats are abundant. His guests will then leave him for their natural hosts, and thus the rats may become infected while the man remains healthy.

At the end of the plague season in any locality plague may die out completely, or the epizootic may continue at a low level through the off-season. In the latter case the locality becomes a focus from which infection will be spread, with the arrival of the next plague season, over the surrounding country. Thus rats with acute plague are caught in Bombay all the year round.

The sum of these investigations may perhaps be expressed as follows. Extinction of rats, extinction of fleas, or exclusion of rats from dwellings might any one of them put an end to human plague, but all are exceedingly difficult to realise. On the other hand, the conditions which determine the off-plague season are not fully known, and may still give an indication of some practicable method of fighting the disease. Further investigation is urgently demanded.

L. N.